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Selection of the Winter Representative Precipitation Station Within a Basin

T. TAKENOUCHI
Formerly with National Defense Academy of Japan
1-12-5 Taira-Machi, Meguro-ku,
Tokyo, 152, Japan

ABSTRACT

The shape of Japan is a narrow island and stretches from southwest to northeast. In winter the wind blows from northeast to southeast. The humid wind which absorbs the high humidity while passing the Sea of Japan, which it releases as snow as it encounters the high mountains.

Here we discuss the case where there is some amount of snowfall in the southern part of the topographic divide. we can estimate the depth of spring runoff from the depth of winter accumulated value at selected station.

We estimated a "model" representing the shape of the land where there is a valley in the northern part, intervening the topographic divide, and a small river basin in the southern part.

In the model, a good correlation can be found between the depth of winter accumulated precipitation at the selected station and the depth of runoff at the dam site.

INTRODUCTION

During winter in Japan there is considerable snow at high elevation. Northeasterly winds, associated with offshore circulation over the Sea of Japan, absorb ample moisture which is released as snow once it encounters the mountains.

A significant proportion of flow in the Tone river basin (Fig.-1) is derived from snowmelt. Notably, contributions from the tributary basins near the topographic divide are controlled by dam works (Fig-1). It is therefore crucial to obtain reliable estimates of runoff to enable proper management of the important resource. One method to do this is to relate snowfall to runoff.

This study discusses the relationship between the winter snowfall measured at sites to the south and north of a significant topographic divide (Fig.-1) and the runoff measured at two dam sites located to the south of the topographic divide. Observations show that there is no significant correction between the snowfall measured in basin at the south of the topographic divide and the runoff measured at the dam sites at the foot of those same basins.

YAGISAWA RIVER BASIN

The right part of Fig.-3 shows that there are numerous river basins in the southern part of the topographic divide.

In this area there is no significant correlation to be obtained between the winter snowfall measured in the basins and the depth of spring runoff measured at the dam sites, that are both located in the southern part of the topographic divide as shown in Fig.-3.

On the hand, the left part of Fig.-3, show the significant correlation can be observed for the same runoff data. This time, however, the selected value at one of the location in the northern part was contributed to this successful outcome.

The measurement of the runoff data is accomplished with the accuracy of correlation value of R=0.89, according to the record between 1966-1990. The maximum error value is computed as 13.8%.

Examinations indicate that the appropriate winter precipitation value needs to be selected in or-

der to obtain reliable estimates of runoff amount at dam site.

YOKOYAMA RIVER BASIN

In Fig.-4, the precipitation stations can be seen on the northern side of the topographic divide.

Imajyo station, one of the network station present as a selected station with significant correlation value of R=0.87. Its analysis record between 1981-1988 shows the minimum value was found to be 35%, which provides another sources of successful estimates.

RESULTS AND DISCUSSIONS

Similar phenomenon was observed at two particular dam sites in Japan where the amount of spring runoff was based on the amount of accumulated winter precipitation at respective dam site.

In this study, Japan's physical features are intensely examined and they are applied as a "topographical model". This "model" represents the ideal condition to determine the significant correlation between winter snowfall and spring runoff data at the dam site.

One of the most important topographical features is discovered to be the position of valley, which needs to be located in the northern part of the topographical divide. As wind blows passing over valley, it absorbs moisture and releases as heavy snow as it blows over the topographic divide, reaching dam site.

Therefore, the discovery of an ideal location plays a great importance, and two of our successful results will be introduced in this study.

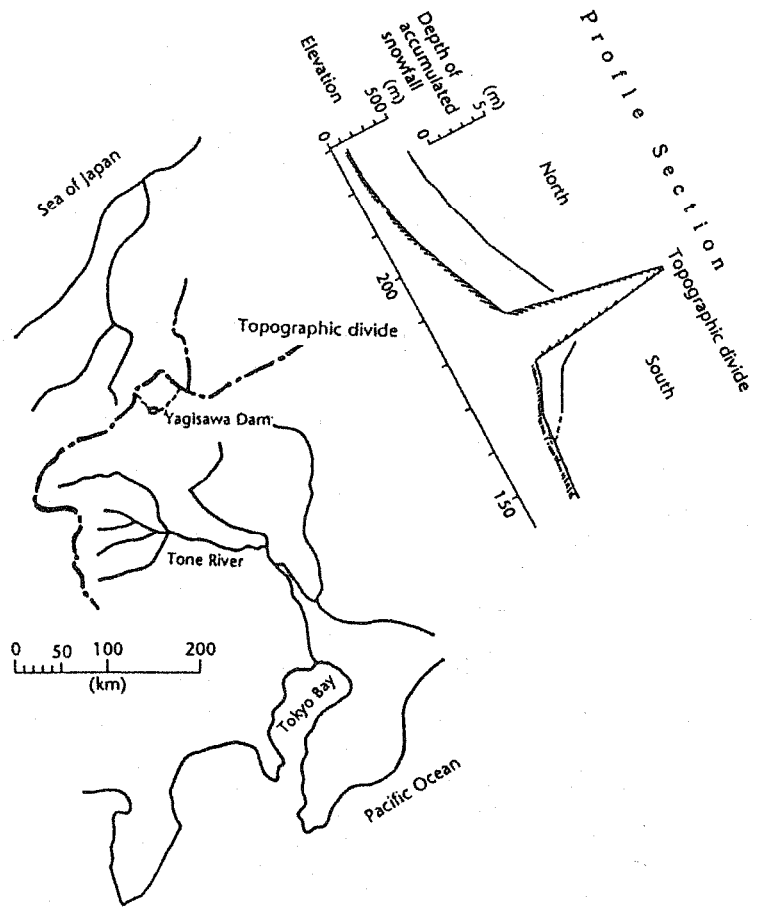

Fig.-1 Plan of the north and south sides of the topographic divide

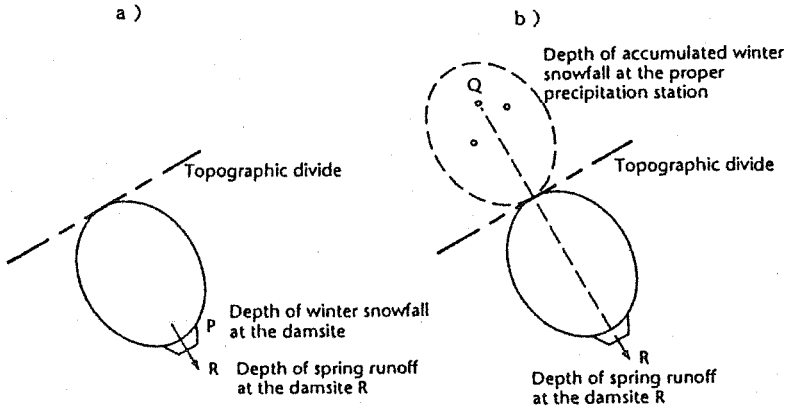

Fig.-2 Model of a combination of a valley and a river basin where the snow is split over the topographic divide.
(a) River basin
(b) Combination of a valley and a river basin

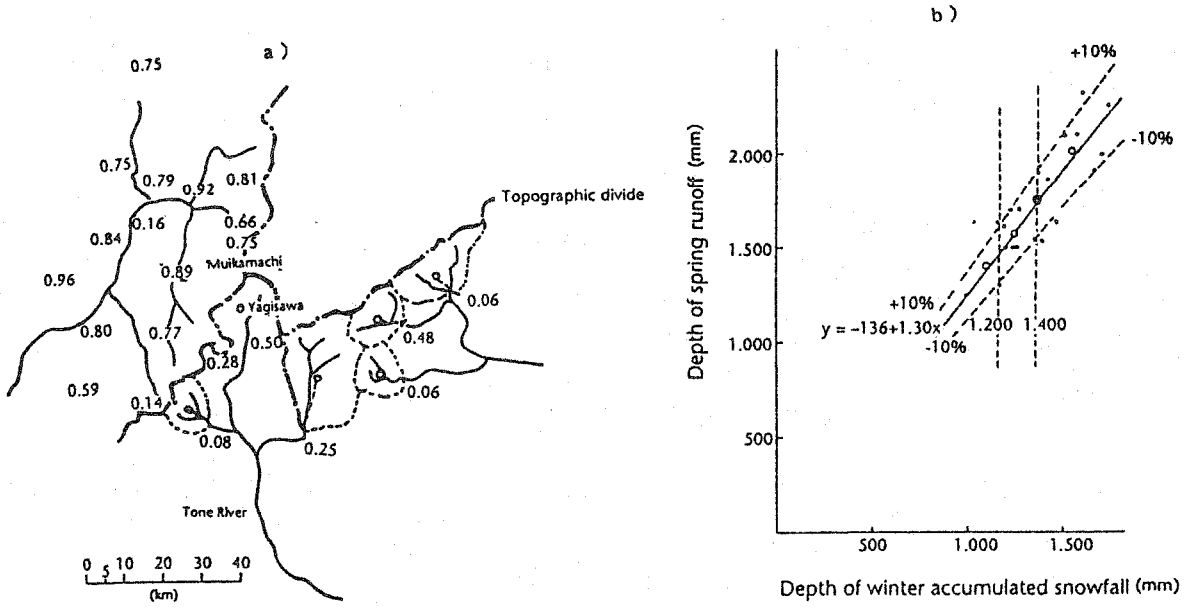

Fig.-3 Yagisawa river basin

(a) Relation between the depth of winter snowfalls at precipitation stations in the valley and the amount of spring runoff at the dam sites in the river basin.

(b) Relation between the accumulation of winter snowfall at Muikamuch station and the amount of spring runoff at the dam site.

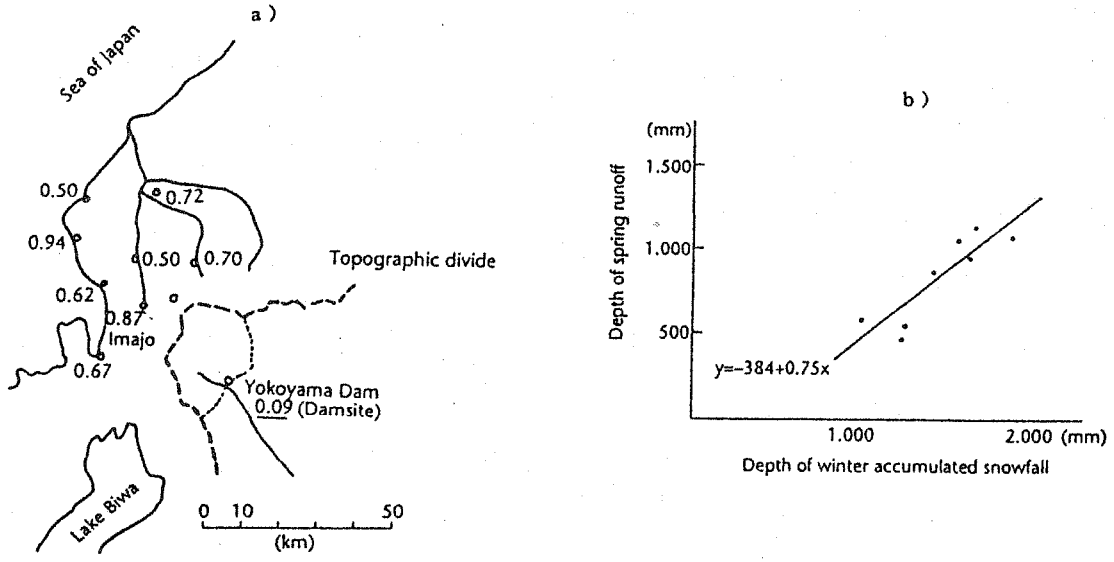

Fig.-4 Yokoyama river basin

(a) Relation between the depth of accumulated winter snowfall at precipitation station in the valley and the spring height of runoff at the dam site in the river basin.

(b) Relation between the depth of accumulated winter snowfall at Imajo precipitation station in the valley and the depth of spring runoff in the river basin.

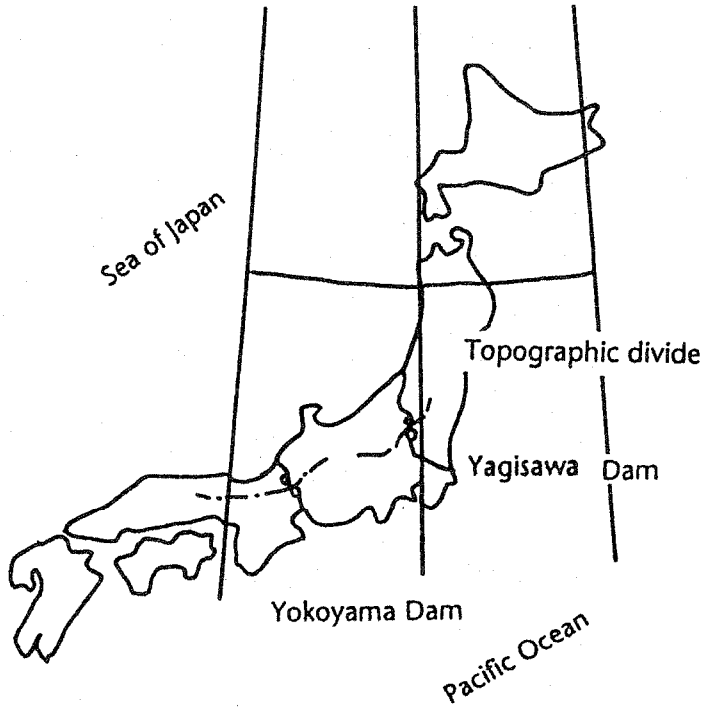

Fig.-5 Two river basins where the depth of winter accumulated snowfall at each proper precipitation station in the valley and the depth of spring runoff at respective dam site station are corrected in good condition